CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

IMPROVEMENT TO SO KWUN PO INTERCHANGE

ENVIRONMENTAL IMPACT ASSESSMENT

ENVIRONMENTAL MONITORING AND AUDIT MANUAL

CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT

IMPROVEMENT TO SO KWUN PO INTERCHANGE

Environmental Impact Assessment

Environmental Monitoring and Audit Manual

DATE: AUGUST 2023

WSP (ASIA) LTD.
7/F ONE KOWLOON
1 WANG YUEN STREET
KOWLOON BAY
HONG KONG

PHONE: +852 2579-8899
FAX: +852 2856-9902
WSP.COM

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 Background 1

1.2 Project Location and Scope 1

1.3 Construction Programme 2

1.4 Purpose of the Manual 2

1.5 Project Organisation 3

1.6 Structure of the EM&A Manual 5

2 GENERAL REQUIREMENTS OF THE EM&A PROGRAMME 6

2.1 Introduction 6

2.2 Objectives of the EM&A Programme 6

2.3 Scope of the EM&A Programme 6

2.4 Methodology and Criteria 7

2.5 Environmental Monitoring 8

2.6 Action and Limit (A/L) Levels 8

2.7 Event and Action Plans 8

2.8 Environmental Audit 8

2.9 Enquiries, Complaints and Requests for Information 9

2.10 Reporting 9

2.11 Change or Cessation of the EM&A Programme 9

3 AIR QUALITY 10

3.1 Introduction 10

3.2 Monitoring Parameters 10

3.3 Monitoring Equipment 10

3.4 Monitoring Locations 11

3.5 Impact Monitoring 12

3.6 Event and Action Plan 12

3.7 Mitigation Measures 14

3.8 Audit Requirements 15

4 NOISE 16
4.1 Introduction 16
4.2 General Monitoring Requirement 16
4.3 Monitoring Parameters of Construction Noise .. 17
4.4 Monitoring Locations for Construction Noise ... 17
4.5 Baseline Monitoring for Construction Noise 17
4.6 Impact Monitoring for Construction Noise 18
4.7 Event and Action Plan for Construction Noise .. 18
4.8 Noise Parameters for Operation Road Traffic Noise 19
4.9 Monitoring Locations for Road Traffic Noise 20
4.10 Impact Monitoring for Operation Road Traffic Noise 21
4.11 Event and Action Plan for Road Traffic Noise ... 21
4.12 Mitigation Measures 22
4.13 Audit Requirements 24
5 WATER QUALITY 25
5.1 Introduction 25
5.2 Mitigation Measures 25
5.3 Construction Site Audits 25
6 WASTE MANAGEMENT 27
6.1 Introduction 27
6.2 Waste Management Approach 27
6.3 Staff Training 29
6.4 Audit Requirements 29
6.5 Mitigation Measures 29
7 LAND CONTAMINATION 31
7.1 Summary 31
8 ECOLOGY 32
8.1 Introduction 32
8.2 Mitigation Measures 32
8.3 Monitoring Requirements 32
8.4 Audit Requirements 33

9 LANDSCAPE AND VISUAL 34
9.1 Introduction 34
9.2 Mitigation Measures 34
9.3 Audit Requirements 34
10 CULTURAL HERITAGE 35
10.1 Introduction 35
10.2 Mitigation Measures 35
11 ENVIRONMENTAL AUDIT 36
11.1 Site Inspection 36
11.2 Compliance with Legal and Contractual Requirements 37
11.3 Environmental Complaints 37
11.4 Logbook 38
12 REPORTING 39
12.1 General 39
12.2 Interim Notification of Environmental Quality Limit Exceedances 39
12.3 Baseline Monitoring Report 39
12.4 Monthly EM&A Reports 40
12.5 Data Keeping 45
12.6 Electronic Reporting of EM&A Information 45

LIST OF FIGURES

FIGURE 1.1	LOCATION OF THE PROJECT
FIGURE 3.1	LOCATION OF PROPOSED CONSTRUCTION DUST MONITORING POINTS
FIGURE 4.1	LOCATION OF PROPOSED CONSTRUCTION NOISE MONITORING POINTS
FIGURE 4.2	LOCATION OF PROPOSED ROAD TRAFFIC NOISE MONITORING POINTS

LIST OF APPENDICES

APPENDIX 1.1	TENTATIVE CONSTRUCTION PROGRAMME
APPENDIX 1.2	IMPLEMENTATION SCHEDULE OF MITIGATION MEASURES
APPENDIX 1.3	PROPOSED PROJECT ORGANISATION AND LINE OF COMMUNICATIONS
APPENDIX 3.1	ON-SITE CHECKING OF DUST MONITORING EQUIPMENT
APPENDIX 4.1	SAMPLE DATA SHEET FOR CONSTRUCTION NOISE MONITORING
APPENDIX 4.2	SAMPLE DATA SHEET FOR ROAD TRAFFIC NOISE MONITORING
APPENDIX 11.1	FLOW CHART OF COMPLAINT RESPONSE PROCEDURES
APPENDIX 12.1	SAMPLE TEMPLATE FOR INTERIM NOTIFICATIONS

1 INTRODUCTION

1.1 BACKGROUND

1.1.1 The title of the Project is “Improvement to So Kwun Po Interchange” (hereafter referred to as the Project).

1.1.2 The So Kwun Po Interchange (SKPIC) is one of the three major interchanges in the North District connecting the northern and southern parts of Fanling and Sheung Shui. The SKPIC has been operating close to its capacity. The SKPIC was allegedly one of the causes of several numbers of serious traffic gridlocks in the North District in the past few years.

1.1.3 Media reports had also suggested that the series of traffic incidents that occurred in January 2016, which paralysed and stranded the District’s external traffic links, was partly due to the traffic gridlock and overcapacity at the Kai Leng Roundabout and other road junctions in the District. The traffic chaos that appeared in these incidents also highlighted the fragility and deficiencies of existing transport infrastructure at some locations in the District where upgrading and/or improvement works are necessary to rectify the situation. The North District Council (NDC) had made requests to the Government for its improvements on various occasions. With the anticipated population increase in the North District following the completion of public and private housing developments which are under planning, the traffic condition at the SKPIC is expected to deteriorate further.

1.1.4 In order to meet anticipated traffic needs and to address public demands, a new road link and junction modification works would be carried out to improve the existing SKPIC.

1.1.5 To address the above congestion problem, the Traffic and Transport Committee of NDC has earlier proposed a new North to South Link in an attempt to mitigate the current traffic situation.

1.2 PROJECT LOCATION AND SCOPE

1.2.1 The location plan of the Project is provided in **Figure 1.1**. The scope of the Project mainly comprises:

(a) construction of north-south link road of about 700m connecting Pak Wo Road and San Wan Road;

(b) reconstruction of sections of So Kwun Po Road near North District Park;

(c) widening of the north-western slip road from So Kwun Po Road to San Wan Road;

(d) reconstruction/realignment of So Kwun Po Road between Kai Leng Roundabout and Pak Wo Road;

(e) improvement works at the junction of San Wan Road and the proposed north-south link road;

(f) improvement works at the junction of Pak Wo Road and So Kwun Po Road;

(g) modification of the existing pedestrian subway connecting North District Park underneath So Kwun Po Road;

(h) construction of a lift and a staircase linking San Wan Road and elevated So Kwun Po Road;

(i) construction of a pedestrian subway across So Kwun Po Road near Pak Wo Road;

(j) re-provision of the skating rink within North District Park affected by the road works; and

(k) associated works including geotechnical, landscape, drainage, water, electrical and mechanical, environmental mitigations, street lighting and utilities works, as well as installation of street furniture and traffic aids.

1.3 CONSTRUCTION PROGRAMME

1.3.1 The construction works of the Project is tentatively scheduled to commence in Year 2025 and to be completed before the end of Year 2030. A preliminary outline construction programme for the Project is provided in **Appendix 1.1**.

1.4 PURPOSE OF THE MANUAL

1.4.1 The purpose of this EM&A Manual is to guide the set up of an EM&A programme to ensure compliance with the EIA Study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This EM&A Manual outlines the environmental monitoring and auditing works for both the construction and operation phases of the Project. It provides systematic procedures for the monitoring and auditing of potential environmental impacts that may arise from the works.

1.4.2 Hong Kong environmental regulations, *Technical Memorandum on Environmental Impact Assessment Processs* (*EIAO-TM)* and the recommendations in the EIA Report of this Project have served as environmental standards and guidelines in the preparation of this EM&A Manual. In addition, this EM&A Manual has been prepared in accordance with the requirements stipulated in *Annex 21* of the *EIAO-TM*.

1.4.3 This EM&A Manual contains the following information:

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), the Environmental Team (ET) and the Independent Environmental Checker (IEC) with respect to the environmental monitoring and audit requirements during the course of the Project;
- Project organisation for the EM&A works of the Project;
- Requirements with respect to the construction programme schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
- Details of the methodologies to be adopted, including all field laboratories and analytical procedures, and details on quality assurance and quality control programme;
- Definition of Action and Limit levels;
- Establishment of Event and Action plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints;
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- Requirements for review of EIA predictions and the effectiveness of the mitigation measures/environmental management systems and the EM&A programme.

1.4.4 This EM&A Manual is a dynamic document that should be reviewed regularly and to be updated (as necessary) during the implementation of the Project. The contractor should regularly review the mitigation measures and project implementation schedule in **Appendix 1.2** with respect to the design developments and construction methodology.

1.4.5 For this EM&A Manual, the "Engineer" refers to the Engineer as defined in the Contract and the ER, in case where the Engineer's power has been delegated to the ER, in accordance with the Contract. The ET Leader, who should be responsible for and in charge of the ET, refers to the person delegated the role of executing the EM&A requirements. The IEC should undertake the auditing role.

1.5 PROJECT ORGANISATION

1.5.1 The roles and responsibilities of the various parties involved in the construction phase EM&A programme are outlined below. The organisation and lines of communication with respect to environmental management for the Project are shown in **Appendix 1.3**.

1.5.2 The leader of the Environmental Team (ET) should be an independent party from the Contractor and should possess at least 7 years of experience in EM&A and have relevant professional qualifications, which should include being an Accredited Monitoring Professional of HKIEIA, subject to the approval of the Environmental Protection Department (EPD). The Independent Environmental Checker (IEC) should have the same experience and professional qualifications as stipulated above for the ET Leader.

1.5.3 The duties and responsibilities of the respective parties are as follows:

Engineer or Engineer's Representative (ER)

- Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
- Monitor the Contractor's compliance with Contract Specifications, including the implementation and maintenance of environmental mitigation measures and other aspects of the EM&A programme;
- Monitor the implementation of the EM&A programme;
- Inform the Contractor when action is required to reduce impacts in accordance with the agreed Event and Action Plans (EAPs) or protocols or those in the Contract Specifications in the event of exceedance or complaint;
- Participate in joint site inspections undertaken by the ET; and
- Adhere to the procedures for carrying out complaint investigation in accordance with this EM&A Manual.

Contractor

- Ensure thorough implementation of mitigation measures as required;
- Provide assistance to the ET in carrying out monitoring and preparing reporting;
- Accompany joint site inspections undertaken by ET and implement the corrective / follow-up actions/recommendations instructed by the Engineer;
- Follow the procedures stipulated in the agreed EAPs in the event of exceedance or complaint;
- Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the EAPs;
- Implement measures to reduce impact whenever Action and Limit levels are exceeded;

- Report all findings of site inspections and corrective/ follow-up actions taken to the ER; and
- Adhere to the procedures for carrying out complaint investigation in accordance with this EM&A Manual.

Environmental Team (ET)

- Monitor the various environmental parameters as required by this or subsequent revisions to the Manual;
- Provide advice on all environmental issues to the Contractor;
- Analyse the EM&A data and review the success of the EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- Carry out site inspection to investigate and audit the Contractor's site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and review the programme of works, in order to anticipate environmental issues that may require mitigation before the problem arises;
- Audit the environmental monitoring data and report the status of general site environmental conditions and the implementation of mitigation measures resulting from site inspections;
- Follow the procedures stipulated in the agreed EAPs in the event of exceedance or complaint;
- Report the EM&A results and wider environmental issues and conditions to the IEC, Contractor, ER, and EPD;
- Prepare EM&A Reports as required in the EM&A Manual
- Recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the EAPs; and
- Adhere to the procedures for carrying out complaint investigation in accordance with this EM&A Manual.

Independent Environmental Checker (IEC)

- Review the EM&A works performed by the ET (at not less than monthly intervals);
- Audit the monitoring activities and results (at not less than monthly intervals);
- Report the audit results to the ER and EPD in parallel;
- Review the EM&A Reports submitted by the ET;
- Review the proposal on mitigation measures submitted by the Contractor in accordance with the EAPs; and
- Adhere to the procedures for carrying out complaint investigation in accordance with this EM&A Manual.

1.5.4 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

1.6 STRUCTURE OF THE EM&A MANUAL

1.6.1 The following sections present the EM&A requirements of various aspects. The structure of the EM&A Manual is outlined as follows:

- Section 2 – General Requirements of the EM&A Programme;
- Section 3 – Sets out EM&A requirements for air quality;
- Section 4 – Sets out EM&A requirements for noise;
- Section 5 – Sets out EM&A requirements for water quality;
- Section 6 – Sets out EM&A requirements for waste management;
- Section 7 – Sets out EM&A requirements for land contamination;
- Section 8 – Sets out EM&A requirements for ecology;
- Section 9 – Sets out EM&A requirements for landscape and visual;
- Section 10 – Sets out EM&A requirements for cultural heritage;
- Section 11 – Describes the scope and frequency of environmental site audits and sets out the procedures for handling environmental complaints; and
- Section 12 – Details the EM&A reporting requirements.

2 GENERAL REQUIREMENTS OF THE EM&A PROGRAMME

2.1 INTRODUCTION

2.1.1 General requirements of the EM&A programme for the Project are presented in this section. The scope of the programme is developed with reference to the findings and recommendations of the EIA Report.

2.2 OBJECTIVES OF THE EM&A PROGRAMME

2.2.1 The potential environmental impacts associated with the Project have been assessed and described in the EIA Report. The EIA Report also specifies the mitigation measures required to comply with the environmental criteria. These mitigation measures and their implementation requirements are presented in the Implementation Schedule (refer to **Appendix 1.2**). The EIA recommends that an EM&A programme be implemented to assess the effectiveness of measures and to confirm that there will be no adverse environmental impacts during all phases of the Project. It is also recommended that regular site audits be undertaken during the construction and operation phases to check whether good site practices are properly implemented to prevent adverse environmental impacts. Any activities that have the potential to cause adverse environmental impacts are identified before the adverse impacts occur. Ad-hoc visits should also be undertaken in response to any complaints or reported non-compliance with environmental standards in order to enable prompt actions to be taken to address the impacts.

2.2.2 This Manual provides details of the EM&A requirements that have been recommended in the EIA Report. The main objectives of the EM&A programme are to:

- Verify the environmental impacts predicted in the EIA Report;
- Monitor the performance of the Project and the effectiveness of mitigation measures;
- Determine Project compliance with regulatory requirements and standards;
- Provide an early indication should any of the environmental control measures or practices fail to achieve the required standards;
- Take remedial action if unexpected problems or unacceptable impacts arise;
- Provide a database against which any short-term or long-term environmental impacts of the Project can be determined; and
- Provide data against which environmental audits may be undertaken.

2.3 SCOPE OF THE EM&A PROGRAMME

2.3.1 The scope of the EM&A Programme is to:

- Establish baseline noise levels at designated locations;
- Implement impact monitoring programmes for construction noise;
- Implement inspection and audit programmes for air quality, noise, water quality, waste management, ecology, landscape and visual and cultural heritage issues;

- Liaise with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the comprehension and consequences of the environmental monitoring data and exceedances;
- Identify and resolve environmental issues and other functions as they may arise from the works;
- Check and advice the Contractor's overall environmental performance, the implementation of EAPs, and remedial actions taken to mitigate adverse environmental impacts as they may arise from the works;
- Conduct monthly reviews of monitored impact data as the basis for assessing compliance with the defined criteria and to ensure that necessary mitigation measures are identified and implemented, and undertake additional ad hoc monitoring and auditing as required by special circumstances;
- Evaluate and interpret all environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards, and to verify the environmental impacts assessed in the EIA Study;
- Manage and liaise with other individuals or parties concerning other environmental issues deemed to be relevant to the construction process;
- Conduct regular site inspections to assess:
    - The level of the Contractor’s general environmental awareness;
    - The Contractor’s implementation of the recommendations in the EIA Report;
    - The Contractor’s performance as measured by the EM&A programme;
    - The need for specific mitigation measures to be implemented or the continued usage of those previously agreed;
    - To advise the Site Staff of any identified potential environmental issues; and
- Submit Monthly EM&A Reports which summarise environmental monitoring and auditing data, with full interpretation illustrating the acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

2.4 METHODOLOGY AND CRITERIA

2.4.1 The environmental issues associated with the construction phase of the Project will be mitigated through the monitoring and mitigation measures specified in the EIA Report and this EM&A Manual.

2.4.2 The monitoring of the effectiveness of the mitigation measures will be achieved through the environmental monitoring programme as well as through site inspections. The inspections will include within scope, mechanisms to review and assess the implementation of the recommended mitigation measures, and that the timely resolutions of received complaints are managed and controlled in a manner consistent with the recommendations given in the EIA Report and the EM&A Manual.

2.5 ENVIRONMENTAL MONITORING

2.5.1 The environmental monitoring works throughout the construction period and the first year after the commencement of operation of the Project should be carried out in accordance with the EM&A Manual and reported by the ET. Monitoring should be conducted at the chosen and agreed representative sensitive receivers.

2.6 ACTION AND LIMIT (A/L) LEVELS

2.6.1 Action and Limit (A/L) Levels are defined levels for impact recorded by the environmental monitoring works, which represent levels at which a prescribed response is required. These levels are described in the principle below and later quantitatively defined in the relevant sections of the EM&A Manual:

- Action Level – beyond which there is a clear indication of a deteriorating ambient environment for which appropriate remedial actions are likely to be necessary to prevent environmental quality from falling outside the Limit Levels, which will be unacceptable.
- Limit Level – statutory limits stipulated in the relevant pollution control ordinances, *EIAO-TM*, or Environmental Quality Objectives established by the EPD. If these are exceeded, works should not proceed without appropriate remedial action, including a critical review of the plant and working methods.

2.7 EVENT AND ACTION PLANS

2.7.1 The purpose of the EAPs is to provide, in association with the environmental monitoring activities, procedures for ensuring that if any significant environmental impacts occur in the form of exceedance of A/L Levels identified in the EM&A programme, cause(s) will be quickly identified and remediated.

2.8 ENVIRONMENTAL AUDIT

2.8.1 The ET should undertake the environmental audit of compliance with stipulated procedures and site inspections of on-site practices. The primary objective is to assess the effectiveness of the implementation of the environmental mitigation measures as recommended in the EIA Report and the EM&A Manual.

2.8.2 Whilst the environmental audit will complement the environmental monitoring activity with regard to the effectiveness of dust suppression and noise attenuation, the criteria against which the audit should be derived from the clauses within the Contract, which seek to enforce the recommendations of the EIA Report and the EM&A Manual.

2.8.3 The findings of the environmental audit and site inspection should be made known to the Contractor at the time of the audit/inspection to enable rapid resolution of identified non-compliances or observations. Non-compliances, observations and the corrective/ follow-up actions undertaken will be reported in the Monthly EM&A Reports.

2.9 ENQUIRIES, COMPLAINTS AND REQUESTS FOR INFORMATION

2.9.1 Enquiries, complaints and requests for information will be expected from a wide range of individuals and organisations including members of the public, government departments, nearby residents, the press and community groups.

2.9.2 All enquiries concerning the environmental effects of the construction works, irrespective of the channel of receipt, will be directed to the Contractor and copied to the ER and CEDD. Procedures for handling enquiries and complaints should follow the procedures set out in **Section 11**.

2.9.3 In all cases, the complainant should be notified of the findings, and an environmental audit and site inspection should be put in place to minimise the reoccurrence of similar problems.

2.10 REPORTING

2.10.1 During the construction phase, Environmental Baseline Monitoring Reports, Monthly EM&A Reports and Final EM&A Review Reports should be prepared and certified by the ET Leader and verified by IEC prior to submission to the Contractor and CEDD. In accordance with *Annex 21* of the *EIAO-TM*, a copy of the monthly EM&A reports and final EM&A review reports should be made available to the Director of Environmental Protection. Details of the reporting requirements and submission schedule should be in accordance with the guidelines set out in **Section 12**.

2.11 CHANGE OR CESSATION OF THE EM&A PROGRAMME

2.11.1 The ET should carry out the EM&A programme in accordance with the EM&A Manual throughout the construction and operation phases of the Project. Any change or cessation of the EM&A programme, or any part of it, should be justified by the ET Leader and verified by the IEC as conforming to the requirements set out in the EM&A Manual and should be submitted to the EPD for approval.

3 AIR QUALITY

3.1 INTRODUCTION

3.1.1 Potential air quality impacts arising from the construction and operation phases of the Project on air sensitive receivers (ASRs) were addressed in the EIA Report. It is concluded that no adverse air quality impact from the Project would be anticipated during the construction phase. Dust monitoring is proposed to be conducted during the construction phase of the Project.

3.1.2 No adverse air quality impact arising would be anticipated during the operation phase of the Project. No operation phase air quality monitoring and audit are therefore considered necessary.

3.1.3 Regular environmental site audit is recommended to be conducted during the entire construction phase of the Project to ensure proper implementation of the proposed dust mitigation measures and good site practices stipulated in the *Air Pollution Control (Construction Dust) Regulation* and those recommended in *Section 3.9* of the EIA Report. The implementation schedule of mitigation measures is presented in **Appendix 1.2**.

3.2 MONITORING PARAMETERS

3.2.1 Monitoring of the Respirable Suspended Particulates (RSP) and Fine Suspended Particulates (FSP) shall be carried out by the ET to ensure that construction works are not generating dust that exceeds the acceptable levels. The monitoring of RSP and FSP levels shall be carried out continuously with logging of hourly data throughout the construction phase.

3.3 MONITORING EQUIPMENT

3.3.1 A particulate matter (PM) monitoring equipment (hereafter referred to as “the Sensor”) capable of performing continuous RSP and FSP monitoring with logging of hourly data should be used. The model of the Sensors to be used shall be proposed by the ET and agreed with the IEC and ER.

3.3.2 The ET is responsible for the provision, installation, operation, maintenance, and dismantling of the Sensors. The ET shall ensure that a sufficient number of Sensors are available for carrying out the continuous RSP and FSP monitoring.

3.3.3 The Sensors shall be calibrated on-site regularly. The on-site calibration shall be done using Transfer Standard (TS) Collocation. A TS is another PM monitor that is at least as capable as the sensor to be calibrated.

On-site Calibration Requirements and Procedures

3.3.4 Another Sensor that has just been calibrated may serve the purpose provided its performance is known to be stable during the collocation period to be used as TS. The TS should be placed near (<1 m if practicable) the Sensor to be calibrated so that both devices would be monitoring a similar environment. The TS is then turned on to warm-up for 30–60 minutes. The collocation period starts after the warm-up and TS is then left running with the Sensor to be calibrated for at least three hours. The measurements from the Sensor to be calibrated and the TS during the collocation period will be statistically analysed. The collocation period should be at least seven days.

3.3.5 Right before each on-site calibration, the TS itself needs to be calibrated e.g. collocating with a PM reference monitor, such as USEPA's Federal Reference Method (FRM) or Federal Equipvalent Method (FEM) PM monitor at EPD's Air Quality Monitoring Station (AQMS) or research institutes that has been calibrated against traceable standard.

3.3.6 The response of the Sensor should be adjusted if its performance during on-site calibration does not meet the following evaluation criteria. For each Sensor, data below its detection limit will be excluded.

- *Tier 1: Correlation* – The minute average measurements from the Sensor and TS when subject to linear regression should have a coefficient of determination (R2) > 0.7. The regression line slope should be between 0.75 to 1.25. If these criteria are not met due to narrow range of PM concentration (30 μg/m^3 as recommended range) during the collocation period, Tier 2 will apply.
- *Tier 2: Root Mean squared error* – The root mean squared error of the Sensor minute average measurements should be <8 μg/m^3.

3.3.7 Each deployed Sensor should be calibrated every month. If a Sensor repeatedly failed in 2 or 3 consecutive calibrations, the Sensor should be checked and maintained to improve its performance or it should be replaced.

3.4 MONITORING LOCATIONS

3.4.1 The selected monitoring locations are considered the worst potentially affected air sensitive receivers located in the vicinity of construction sites. The proposed air quality monitoring locations during the construction phase are listed in **Table 3.1** below and shown in **Figure 3.1**.

Table 3.1 Proposed Construction Dust Monitoring Locations

Construction Dust Monitoring Location ID	ASR ID in EIA Report	Location	Approximate Horizontal Distance from the Construction Project Site Boundary (m)
CDM1	A19	Sheung Shui Disciplined Services Quarters	50
CDM2	A16	Sheung Shui Government Secondary School	20
CDM3	A10	Vienna Garden	5
CDM4	A09	S.K.H. Wing Chun Primary School	20
CDM5	A05	TWGHs Hong Kong and Kowloon Electrical Appliances Merchants Association Limited School	40
CDM6	A22	TWGHs Ma Kam Chan Primary School	55
CDM7	A13	Eden Garden	5
CDM8	A25	North District Park	10

3.4.2 The status and locations of the air quality sensitive receivers may change after issuing this Manual. In such case, the ET shall propose updated monitoring locations and seek approval from ER and IEC and agreement from EPD on the proposal.

3.4.3 When alternative monitoring locations are proposed, the following criteria, as far as practicable, shall be followed:

- At the site boundary or such locations close to the major dust emission source;

- Close to the air sensitive receivers as defined in the EIAO-TM;
- Proper position/sitting and orientation of the Sensors; and
- Take into account the prevailing meteorological conditions.

3.4.4 The ET shall agree with the IEC on the position of the installation of the Sensors. When positioning the Sensors, the following points shall be noted:

- A horizontal platform with appropriate support to secure the Sensors against gusty wind shall be provided;
- The distance between the Sensor and an obstacle, such as building, must be at least twice the height that the obstacle protrudes above the Sensor;
- A minimum of 2-metre of separation from walls, parapets and penthouses is required for Sensor on rooftop;
- A minimum of 2-metre of separation from any supporting structure, measured horizontally is required;
- No furnace or incinerator flue is nearby;
- Airflow around the sampler is unrestricted;
- The Sensor is more than 20-metre from the dripline;
- Any wire fence and gate, to protect the Sensors, shall not cause any obstruction during monitoring;
- Permission must be obtained to set up the Sensors and to obtain access to the monitoring stations; and
- A secured supply of electricity is needed to operate the Sensors.

3.5 IMPACT MONITORING

3.5.1 The ET shall carry out continuous RSP and FSP monitoring throughout the construction phase of the Project. In case of non-compliance with the air criteria, actions as specified in the EAP in the following section, should be conducted. The impact monitoring programme is summarised in **Table 3.2**.

3.5.2 The IEC, if considered necessary, can conduct an on-site audit to ensure the accuracy of the impact monitoring results.

Table 3.2 Summary of Construction Dust Monitoring Programme

Monitoring Period	Duration	Frequency
Impact Monitoring	Throughout the construction phase	Continuous with data logging at 1-hour intervals

3.6 EVENT AND ACTION PLAN

3.6.1 The ET shall compare the impact monitoring results with air quality criteria set up for 1-hour and 24-hour average RSP, and 24-hour average FSP. **Table 3.3** shows the air quality criteria,

namely action and limit levels to be used. The action and limit levels may be subject to change based on the prevailing AQOs implemented at the time of the dust monitoring works.

3.6.2 Should non-compliance with the air quality criteria occur, action in accordance with the EAP in **Table 3.4** shall be carried out.

Table 3.3 Action and Limit Levels for Air Quality (Construction Dust)

Parameter	Action Level [(a)]	Limit Level
1-hour RSP	150μg/m^3	-
24-hour RSP (rolling average)	-	100
24-hour FSP (rolling average)	-	50

Table 3.4 Event and Action Plan for Air Quality (Construction Dust)

Event	Action			
	ET	IEC	ER	Contractor
Action level exceedance for one sample	1. Notify IEC and ER; 2. Check the monitoring data and error messages to confirm if the performance of the monitoring equipment is normal; 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures;Identify the source, investigate the causes of the complaint and propose remedial measures; 4. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops.	1. Check monitoring data submitted by ET; 2. Check the Contractor's working method; 3. Discuss with ET, ER and Contractor on possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with IEC and ET, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures are properly implemented.	1. Identify the source(s) of exceedance and discuss with ER, ET and IEC on possible remedial measures; 2. Implement remedial measures; and 3. Amend working methods if appropriate.
Action level exceedance for two or more consecutive samples	1. Notify IEC and ER; 2. Check the monitoring data and the performance of the monitoring equipment (refer to **Appendix 3.1**); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and	1. Check monitoring data submitted by ET; 2. Check the Contractor's working method; and verify the performance of the monitoring equipment to be checked by ET (refer to **Appendix 3.1**); 3. Discuss with ER, ET and Contractor on	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with IEC and ET, agree with the Contractor on the proposal for remedial measures to be implemented;	1. Identify the source and investigate the causes of exceedance; 2. Submit proposals for remedial measures to the ER with a copy to ET and IEC within three working days of notification;

Event	Action			
	ET	IEC	ER	Contractor
	propose remedial measures; 4. Discuss with IEC, ER and Contractor on possible remedial measures required; 5. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops; 6. Notify EPD if the exceedance is confirmed to be related to the Project.	possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Supervise the Implementation of remedial measures.	4. Ensure the proposal for remedial measures are properly implemented	3. Implement the agreed proposals; and 4. Amend the proposal as appropriate.
Limit level exceedance for one 24-hr rolling average RSP concentration record or/and one 24-hr rolling average FSP concentration record	1. Notify IEC, ER, Contractor and EPD; 2. Check the monitoring data and the performance of the monitoring equipment (refer to **Appendix 3.1**); 3. If exceedance is confirmed, identify source(s), investigate the causes of exceedance and propose remedial measures; 4. Discuss with IEC, ER and Contractor on possible remedial measures required; 5. Assess effectiveness of Contractor's remedial measures and keep IEC and ER informed of the results until exceedance stops. 6. Notify EPD if the exceedance is confirmed to be related to the Project.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; and verify the performance of the monitoring equipment to be checked by ET (refer to **Appendix 3.1**); 3. Discuss with ER, ET and Contractor on the possible remedial measures; 4. Advise ER and ET on the effectiveness of the proposed remedial measures; 5. Review Contractor's remedial measures whenever necessary to assure their effectiveness and advise ER and ET accordingly; 6. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify Contractor; 3. In consultation with the IEC and ET, agree with the Contractor on the proposal for remedial measures to be implemented; 4. Ensure the proposal for remedial measures are properly implemented; 5. If exceedance continues, identify what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Identify the sources and discuss with ER, ET and IEC on possible remedial measures; 2. Take immediate action to avoid further exceedance; 3. Submit a proposal for remedial measures to ER, IEC and ET within 2 working days of notification of exceedance for agreement; 4. Implement the agreed proposal; 5. Review and resubmit proposals if the problem is still not under control; 6. Stop the relevant portion of works as determined by ER until the exceedance is abated.

3.7 MITIGATION MEASURES

3.7.1 Mitigation measures for construction phase air quality impact have been recommended in the EIA Report. All recommended mitigation measures are detailed in the implementation

schedule presented in **Appendix 1.2**. The Contractor shall be responsible for the design and implementation of these measures.

3.8 AUDIT REQUIREMENTS

3.8.1 Regular environmental site inspections and audits at least once per week should be conducted during the entire construction phase of the Project to ensure the recommended mitigation measures are properly implemented. The audit programme serves to verify and keep track of the implementation status of the recommended mitigation measures and the effectiveness of these mitigation measures.

4 NOISE

4.1 INTRODUCTION

4.1.1 The potential construction noise impact and road traffic noise impact during the operation of the Project have been assessed in the EIA.

4.1.2 Recommendations on construction noise mitigation measures have been given in the EIA to mitigate the noise impact. A noise monitoring and audit programme is recommended to be undertaken to confirm the proposed mitigation measures have been implemented properly.

4.1.3 For road traffic noise impact, mitigation measures including the provision of low-noise road surfacing and noise barriers have been recommended to be implemented along some of the Project Roads. Road traffic noise levels should be monitored at representative Noise Sensitive Receivers (NSRs), which are in the vicinity of the recommended direct mitigation measures, during the first year after road opening. The purpose of the monitoring is to ascertain that the recommended mitigation measures are effective in mitigating the noise impacts.

4.1.4 In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of noise impacts during the construction phase and operation phase of the Project are presented.

4.2 GENERAL MONITORING REQUIREMENT

4.2.1 With reference to the *Technical Memorandum* (TM) issued under the *Noise Control Ordinance* (NCO), sound level meters in compliance with the *International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1)* specifications shall be used for carrying out the noise monitoring. The accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency, immediately prior to and following each noise measurement. Measurements shall be accepted as valid only if the calibration level from before and after the noise measurement agrees to be within 1.0dB(A).

4.2.2 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5m/s or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

4.2.3 The ET is responsible for the provision of the monitoring equipment. The ET shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled. The location of equipment installation shall be proposed by the ET Leader and agreed with the IEC and EPD.

4.2.4 The noise monitoring station shall normally be at a point 1m from the exterior of the sensitive receiver building façade and be a position of 1.2m above ground. If there is a problem with access to the normal monitoring position, an alternative position shall be chosen, and a correction to the measurements shall be made. For reference, a correction of +2.5dB(A) and +3dB(A) shall be made to the free field measurements for road traffic noise and construction noise respectively. The ET shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

4.3 MONITORING PARAMETERS OF CONSTRUCTION NOISE

4.3.1 The construction noise levels shall be measured for the time period between 07:00 and 19:00 on normal weekdays using 30-minute A-weighted equivalent continuous sound pressure level ($L_{eq(30\text{-}min)}$) as the monitoring parameter, other parameters including L_{10} and L_{90} should also be taken for reference. A sample data record sheet for construction noise monitoring is shown in **Appendix 4.1** for reference.

4.4 MONITORING LOCATIONS FOR CONSTRUCTION NOISE

4.4.1 The proposed noise monitoring locations during the construction phase are shown in **Figure 4.1**. Details of the proposed noise monitoring locations are summarised in **Table 4.1**.

Table 4.1 Proposed Construction Noise Monitoring Locations

Construction Noise Monitoring Location ID	NSR ID in EIA Report	Location
CNM1	SSDSQ	Sheung Shui Disciplined Services Quarters Block B
CNM2	SSGSS	Sheung Shui Government Secondary School
CNM3	ViG	Vienna Garden
CNM4	AMALS	TWGHs Hong Kong and Kowloon Electrical Appliances Merchants Association Limited School
CNM5	EG	Eden Garden
CNM6	SKP	So Kwun Po

4.4.2 The status and location of NSRs may change after issuing this manual. If such case exists, the ET Leader should propose updated monitoring locations and seek approval from EPD and agreement from the ER and the IEC before baseline monitoring commences.

4.4.3 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:

- Alternative locations should be similarly exposed to potential noise impacts;
- It should be close to the NSRs; and
- It should be located where there would be minimal disturbance to the occupants.

4.5 BASELINE MONITORING FOR CONSTRUCTION NOISE

4.5.1 The ET shall carry out baseline noise monitoring prior to the commencement of the construction activities. The baseline noise monitoring shall be carried out daily at all of the identified monitoring stations for a period of at least two weeks prior to the commencement of the construction works. The ET shall develop a baseline monitoring schedule and submit it to the IEC for approval prior to the commencement of the baseline monitoring.

4.5.2 There shall not be any construction activities in the vicinity of the monitoring stations during the baseline monitoring.

4.5.3 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD and in consultation with the IEC to agree on an appropriate set of data to be used as a baseline reference.

4.6 IMPACT MONITORING FOR CONSTRUCTION NOISE

4.6.1 Construction noise monitoring should be carried out at the designated monitoring stations when there are Project-related construction activities. An initial guide on the monitoring is to obtain one set of 30-minute measurement at each station between 07:00 and 19:00 hours on normal weekdays at a frequency of once per week when construction activities are underway.

4.6.2 If construction works are extended to include works during the hours of 19:00 to 07:00, and/or percussive piling is being carried out, applicable permits under NCO shall be obtained by the Contractor. The monitoring requirements and conditions, if any, stipulated in the permits have to be followed.

4.6.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the EAP in **Table 4.3** shall be carried out. This additional monitoring shall continue until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

4.7 EVENT AND ACTION PLAN FOR CONSTRUCTION NOISE

4.7.1 The Action and Limit levels for construction noise are defined in **Table 4.2**. Should non-compliance with the criteria be identified, action in accordance with the EAP in **Table 4.3** shall be carried out.

Table 4.2 Action and Limit Levels for Construction Noise

Period of Time	Action Level	Limit Level
07:00 to 19:00 on normal weekdays	When one documented complaint is received	75dB(A) [(b)]

Notes:
(a) If works are to be carried out during restricted hours (i.e. 07:00 to 19:00) and/or percussive piling is to be carried out, the monitoring requirements and the conditions, if any, stipulated in the CNP issued by the Noise Control Authority shall be followed.
(b) Limit Level reduced to 70dB(A) and 65dB(A) for schools during normal teaching periods and school examination periods, respectively.

Table 4.3 Event and Action Plan for Construction Noise

Event	Action			
	ET	IEC	ER	Contractor
Action Level	1. Notify IEC and Contractor; 2. Carry out the investigation; 3. Report the results of the investigation to the IEC, ER and Contractor; 4. Discuss with the Contractor and	1. Review the analyzed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; and	1. Confirm receipt of notification of failure in writing; 2. Notify the Contractor; 3. Require the Contractor to propose remedial measures for the analyzed noise problem; and	1. Submit noise mitigation proposals to IEC; and 2. Implement noise mitigation proposals.

Event	Action			
	ET	IEC	ER	Contractor
	formulate remedial measures; and 5. Increase monitoring frequency to check mitigation effectiveness.	3. Supervise the implementation of remedial measures.	4. Ensure remedial measures are properly implemented.	
Limit Level	1. Identify source; 2. Inform IEC, ER, EPD and Contractor; 3. Repeat measurements to confirm findings; 4. Increase monitoring frequency; 5. Carry out an analysis of the Contractor's working procedures to determine possible mitigation to be implemented; 6. Inform IEC, ER and EPD on the causes and actions taken for the exceedances; 7. Assess the effectiveness of the Contractor's remedial actions and keep IEC, EPD and ER informed of the results; and 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; and 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify the Contractor; 3. Require the Contractor to propose remedial measures for the analyzed noise problem; 4. Ensure remedial measures are properly implemented; and 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if the problem is still not under control; and 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

4.8 NOISE PARAMETERS FOR OPERATION ROAD TRAFFIC NOISE

4.8.1 Notwithstanding the prediction that the NSRs will not be subject to adverse noise impact during the operation phase of the Project with the implementation of the proposed noise mitigation

measures, noise monitoring should be carried out during the first year after opening to ensure accuracy of the traffic noise predictions.

4.8.2 The traffic noise levels should be measured twice at six-month intervals within the first year upon completion of the Project. Measurements should be made in terms of the A-weighted L_{10} over three half-hour periods during the peak traffic hour, other parameters including L_{eq} should also be taken for reference.

4.8.3 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5m/s or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

4.9 MONITORING LOCATIONS FOR ROAD TRAFFIC NOISE

4.9.1 As shown in **Table 4.4** and **Figure 4.2**, five designated monitoring locations are selected for the operation phase noise monitoring.

Table 4.4 Proposed Road Traffic Noise Monitoring Locations

Road Traffic Noise Monitoring Location ID	NSR ID in EIA Report	Location	Proposed Mitigation Measures Nearby
TNM1	SSDSQ	Sheung Shui Disciplined Services Quarters	3m High Vertical Barriers
TNM2	SSGSS	Sheung Shui Government Secondary School	LNRS, 3m and 5m High Vertical Barriers
TNM3	ViG	Vienna Garden	LNRS, 5m Vertical with 2.5m Cantilever Barriers
TNM4	AMALS	TWGHs Hong Kong and Kowloon Electrical Appliances Merchants Association Limited School	3m High Vertical Barriers
TNM5	SKP	So Kwun Po	3m High Vertical Barriers

4.9.2 The monitoring locations should be selected according to the following criteria:

- They should be at NSRs in the vicinity of recommended direct technical remedies; preferably, there should be one representative monitoring location near each type of noise screening element (i.e. LNRS, vertical barrier, cantilever barrier and enclosure);
- One high floor and one medium floor monitoring point should be chosen at each location as far as practicable; and
- Selected monitoring locations should allow monitoring to be done twice within one year after the implementation of the mitigation measures during the operation of the Project.

4.9.3 The status and locations of the NSRs may change after this Manual is issued. If such cases exist, the ET Leader should propose updated monitoring locations and seek approval from the ER and IEC and agreement from EPD of the proposal.

4.9.4 When alternative monitoring locations are proposed, the monitoring locations should be chosen based on the following criteria:

- Alternative locations should be similarly exposed to potential noise impacts;
- It should be close to the NSRs; and

- It should be located where there would be minimal disturbance to the occupants.

4.10 IMPACT MONITORING FOR OPERATION ROAD TRAFFIC NOISE

4.10.1 The operation phase noise monitoring should be carried out at a distance of 1m from the openable window and 1.2m above the floor level of the noise sensitive receivers identified. The ET Leader should agree with the IEC on any necessary corrections adopted.

4.10.2 Traffic noise monitoring should be carried out at all the designated traffic noise monitoring stations. The following is an initial guide on the traffic noise monitoring requirements during the operation phase:

- One set of measurements at the morning traffic peak hour on a normal weekday;
- One set of measurements at the evening traffic peak hour on a normal weekday;
- A concurrent census of traffic flow and percentage of heavy vehicles shall be conducted for the Project roads and the existing road network in the vicinity of each measuring point;
- Average vehicle speed estimated for Project road and the existing road network in the vicinity of each measuring point; and
- The two sets of monitoring data should be obtained within the first year of operation.

4.10.3 Measured noise levels should be compared with the predicted noise levels by applying appropriate conversion corrections to allow for the traffic conditions at the time of measurement. A sample data record sheet for traffic noise monitoring during the operation phase is shown in **Appendix 4.2** for reference.

4.10.4 Each set of measurements shall include three measurements of 30-minute. The parameters L_{10}, L_{eq}, L_{90} and L_{max} shall be recorded for data auditing and reference.

4.10.5 The ET shall prepare a monitoring plan for the purpose of assessing the accuracy of the traffic noise predictions by comparing the noise impact predictions with the actual impacts. The monitoring plan shall be submitted to EPD at least six months before the operation of the proposed roads under the Project. The monitoring plan shall include monitoring locations, monitoring schedules, methodology of noise monitoring such as noise measurement procedures, traffic counts and speed checks, and methodology of comparison with the predicted levels. The ET shall follow the monitoring plan unless with prior justifications. Monitoring details and results including the comparison between the measured noise levels and the predicted levels should be recorded in a report to be deposited with EPD within one month of the completion of the monitoring. The report should be certified by the ET Leader before submitting it to EPD.

4.11 EVENT AND ACTION PLAN FOR ROAD TRAFFIC NOISE

4.11.1 The measured road traffic noise levels should be compared with the predicted results and the predicted traffic flow conditions (calculated noise levels based on concurrent traffic census obtained). In case discrepancies are observed, explanations should be given to justify the discrepancies.

4.12 MITIGATION MEASURES

Construction Phase

4.12.1 In order to reduce the noise impact of construction site activities on nearby NSRs, the following mitigation measures have been considered:

- Use of Quality Power Mechanical Equipment (QPME);
- Adoption of temporary movable noise barriers;
- Use of acoustic enclosure;
- Use of noise-insulating fabric;
- Scheduling of PME/construction activities; and
- Construction noise management plan.

Use of QPME

4.12.2 The use of QPME was considered to be a practicable means to mitigate the construction noise impact. A quiet plant is defined as a PME having an actual SWL lower than the value specified in the GW-TM.

Adoption of Temporary Movable Noise Barriers

4.12.3 The use of temporary movable noise barriers will be an effective means to mitigate the noise impact arising from the construction works, particularly for low-rise NSRs. For the low-rise nature of the NSRs, movable noise barriers of 3m to 5m high (depending on the size of the plant that requires to be screened) with skid footing should be used and located within a few metres of stationary plants and mobile plants such that the line of sight to the NSR is blocked by the barriers. The length of the barriers should be at least five times greater than its height. These movable noise barriers could produce at least 5dB(A) noise reduction for mobile plants such as backhoes and rollers as well as large-scale plants such as cranes.

Use of Acoustic Enclosure

4.12.4 Temporary acoustic enclosure is a common and effective means to mitigate the noise impact arising from the operation of certain small-size PMEs. A frame covered with noise insulation materials (sound insulation materials with a superficial surface density of at least 14kg/m^2 or sound absorbing materials of at least 50mm and average absorption coefficient between 125Hz and 4000Hz of 0.4) could at least achieve 5dB(A) to 10dB(A) reduction for plant items such as hand-held breaker and circular wood saw. The locations of the temporary acoustic enclosure should be adjusted wherever and whenever necessary to protect the noise sensitive receivers, the enclosures should have no openings or gaps.

Use of Noise-Insulating Fabric

4.12.5 Noise insulation fabric would be installed for PMEs such as drill rigs and piling, large diameter bored and reverse circulation drills. These fabrics should be lapped such that there would be no openings or gaps in the joints.

Scheduling of Construction Works

4.12.6 The Contractor shall liaise with the school representative(s) to obtain the examination schedule so as to avoid noisy construction activities during the school examination period. Scheduling construction works outside the school examination period to less intrusive periods or restricting

critical works areas would reduce the overall construction noise impacts at the NSRs and ensure compliance with the construction noise criterion.

Construction Noise Management Plan

4.12.7 A construction noise management plan should be prepared during the design/tendering and implementation stage of the construction works, to verify the inventory of noise sources, update the construction noise impact assessment if necessary, assess the effectiveness and practicality of all identified measures and update the proposed noise mitigation measures as necessary.

4.12.8 The implementation schedule for the recommended mitigation measures is presented in **Appendix 1.2**.

Operation Phase

Road Traffic Noise

4.12.9 Direct noise mitigation measures including low noise road surfacing (LNRS), noise barriers and full enclosure have been proposed to alleviate the traffic noise impact. **Table 4.5** summarise the proposed noise mitigation measures.

Table 4.5 List of Proposed Noise Mitigation Measures

Proposed Noise Mitigation Measures	NMM ID	Location	Approximate Length, m (rounded off to the nearest 10m)
LNRS	SKPL-LNRS1	SKPL	330
	SKPL-LNRS2		350
Cantilever Barrier (5m high with 2.5m long ∠45° cantilever)	SKPL-7.5mVCB1		80
Cantilever Barrier (5m high with 2.5m long ∠45° cantilever)	SKPL-7.5mVCB2		170
3m Vertical Barrier	SKPL-3mVB1		100
3m Vertical Barrier	SKPL-3mVB2		80
5m Vertical Barrier	SKPL-5mVB1		90
LNRS	SKPRNB-LNRS1	SKPR (North Bound)	110
3m Vertical Barrier	SKPRNB-3mVB1		100
5m Vertical Barrier	SKPRNB-5mVB1		50

4.12.10 After implementing the proposed LNRS and noise barriers, the predicted overall noise levels at all NSRs comply with the relevant noise criteria. Based on the criteria as stated in Section 4.9.4 of the EIA Report, the eligibility test for indirect noise mitigation measures is conducted. Details of the eligibility test are given in Appendix 4.14 of the EIA Report. As no representative existing NSRs would fall within all three testing criteria, it is considered that no indirect mitigation measures would be required.

4.12.11 The feasibility, practicability, programming and effectiveness of the above mitigation measures have been reviewed and confirmed by the engineer. Environmental reviews shall be conducted at a later design stage to review and ascertain the proposed provisional noise mitigation measures taking into account the latest design standard at that time for the suitability and application of the LNRS materials.

4.12.12 The implementation schedule for the recommended mitigation measures is presented in **Appendix 1.2**.

4.13 AUDIT REQUIREMENTS

4.13.1 Regular environmental site inspections and audits during the construction phase of the Project should be conducted at least once per week to ensure proper implementation of mitigation measures and good site practices as listed in **Appendix 1.2** and the noise control requirements stated in EPD's *Recommended Pollution Control Clauses for Construction Contracts* to further minimise the potential noise nuisance during the construction phase.

5 WATER QUALITY

5.1 INTRODUCTION

5.1.1 Potential water pollution sources from the construction and operation of the Project have been identified including construction site runoff, wastewater from general construction activities, diversion / modification of box culvert, accidental spillage and sewage effluent from the construction workforce. With the implementation of the recommended mitigation measures, no unacceptable water quality impacts would be expected. No water quality monitoring is therefore considered necessary. Regular site inspections and audits are recommended during the construction phase to ensure the recommended mitigation measures are properly implemented.

5.2 MITIGATION MEASURES

5.2.1 Mitigation measures for water quality control during the construction phase have been recommended in the EIA Report. The Contractor should be responsible for the design and implementation of these measures. Recommended mitigation measures to minimise the adverse impacts on water quality during the construction activities are listed in the implementation schedule given in **Appendix 1.2**.

5.3 CONSTRUCTION SITE AUDITS

5.3.1 Regular site inspections and audits should be conducted to ensure that the recommended mitigation measures are properly implemented during the construction phase of the Project. It can also provide effective control of any malpractices and therefore achieve continual improvement of environmental performance on site.

Site Inspections

5.3.2 Regular site inspections shall be carried out by the ET at least once per week and shall be based on the mitigation measures for water pollution control recommended in **Appendix 1.2**. If the recommended mitigation measures are not fully or properly implemented, the deficiency shall be recorded and reported to the site management. Suitable actions are to be carried out to:

(i) Investigate the problems and the causes;

(ii) Issue action notes to the Contractor who is responsible for the works;

(iii) Implement remedial and corrective actions immediately;

(iv) Re-inspect the site conditions upon completion of the remedial and corrective actions; and

(v) Record the event and discuss it with the Contractor for preventive actions.

Compliance Audits

5.3.3 Monitoring of the treated effluent quality from the Works Areas is required during the construction phase of the Project. The monitoring shall be carried out at the pre-determined discharge point. Compliance audits are to be undertaken to ensure that a valid discharge licence has been issued by EPD prior to the discharge of effluent from the Project site. The monitoring frequency and parameters specified in the discharge licence shall be followed during

the monitoring. All monitoring requirements shall be approved by EPD. The audit results reflect whether the effluent quality complies with the discharge licence requirements. In case of non-compliance, suitable actions shall be undertaken to:

(i) Notify the site management about the non-compliance;

(ii) Identify the sources of pollution;

(iii) Check the implementation status of the recommended mitigation measures;

(iv) Investigate the operating conditions of the on-site treatment systems;

(v) Implement corrective and remedial actions to improve the effluent quality;

(vi) Increase monitoring frequency until the effluent quality complies with the discharge licence requirements; and

(vii) Record the non-compliance and propose preventive measures.

6 WASTE MANAGEMENT

6.1 INTRODUCTION

6.1.1 Construction and Demolition (C&D) materials, chemical waste and general refuse from the workforce would be generated during the construction phase. This section sets out the handling, recycling, storage, transportation and disposal measures for these wastes which are recommended to avoid and minimise potential adverse impacts associated with waste arising from the construction of the Project.

6.1.2 It is expected that no waste will be generated as a result of the operation of the Project, and thus there would be no adverse environmental impacts related to waste management during the operation phase of the Project. Monitoring and audit programme for the operation phase of the Project would not be required.

6.2 WASTE MANAGEMENT APPROACH

Management of Waste Disposal

6.2.1 In accordance with the *Waste Disposal (Charges for Disposal of Construction Waste) Regulation*, the Contractor should open a billing account with the EPD. Every construction waste or public fill load to be transferred to the Government waste disposal facilities, namely public fill reception facilities, construction waste sorting facilities, and landfills will require a valid "chit" which contains information of the account holder (the Contractor) to facilitate waste transaction recording and billing to the waste producer.

6.2.2 Inert C&D materials generated from the Project will be transferred to Tuen Mun Area 38 Fill Bank (TMFB), or other public fill reception facilities, managed by Civil Engineering and Development Department (CEDD), while the non-inert C&D materials, after segregation, will be sent to North East New Territories Landfill (NENT) or North East New Territories Landfill Extension (NENTX), or other waste disposal facilities, managed by the EPD.

6.2.3 A trip-ticket system will also be established in accordance with *DevB TC(W) No.6/2010* to monitor the disposal of construction waste at the landfill and to control fly-tipping. In addition, all dump trucks should be equipped with GPS or equivalent systems for monitoring their transportation routes and parking locations to prohibit illegal dumping and landfilling of C&D materials. The Contractor should maintain a recording system to record the amount of C&D materials generated, recycled and disposed of at the disposal sites as well as the transportation routing and parking locations of the dump trucks. The trip-ticket system and the abovementioned recording system will be included as part of the contractual requirements and implemented by the Contractor(s).

6.2.4 As per recommendation under *ETWB TC(W) No. 19/2005*, a WMP, with details of the amount of waste generated, recycled and disposed of (including the disposal sites), will be established and implemented during the construction phase as part of the EMP. The Contractor will be required to prepare the EMP and submit it to the ER under the Contract for approval prior to implementation.

Approach to Reduce Waste Generation

Construction and Demolition (C&D) Materials

6.2.5 C&D materials generated from the construction works of the Project comprise both inert C&D materials (i.e. excavated soil, rock, broken concrete) and non-inert C&D materials (i.e.

vegetation, wood, plastics, packaging materials, etc.). The inert C&D materials will be segregated from other non-inert C&D materials and be sent to TMFB, or other public fill reception facilities. The non-inert C&D materials will be further segregated into recyclable materials, such as cardboard, carton box, waste paper and scrap metal for collection by recyclers, and non-recyclable materials, such as waste timber and packaging materials, which will be disposed of at NENT/NENTX, or other waste disposal facilities.

General Refuse

6.2.6 General refuse will be generated from daily site office operations and workforce. Recycling bins should be provided at strategic locations, such as the entrance of the site office to facilitate the recovery of aluminium cans and waste paper generated from the Site. Materials collected in the recycling bins should be collected by or sold to local recyclers.

Management of Chemical Waste

6.2.7 Chemical wastes likely to be generated from the construction of the Project may include residual paints and solvents and used lubricant oil from maintenance of the construction plant. It is anticipated that the quantity of chemical waste to be generated will be small and in the order of a few hundred litres per month during the construction phase. These chemical wastes will be stored and disposed of in an appropriate manner, as outlined in the *Waste Disposal (Chemical Waste) (General) Regulation* and the *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes*.

6.2.8 The Contractor should register as a chemical waste producer with the EPD, and handle the chemical waste in accordance with the *Code of Practice on the Package, Labelling and Storage of Chemical Wastes*. A brief summary of the site arrangement should be as follows:

Storage Containers

- Be suitable for the substance they are holding, resistant to corrosion, maintained in good condition, and securely closed;
- Have a capacity of less than 450L unless specifications have been approved by the EPD; and
- Display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations.

Storage Area

- Be clearly labelled and used solely for the storage of chemical waste;
- Be enclosed on at least three sides;
- Have an impermeable floor and bunding, of a capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in that area, whichever is the greatest;
- Have adequate ventilation;
- Be covered to prevent rainfall entering (with water collected within the bund be disposed of as chemical waste when necessary); and
- Be arranged so that incompatible materials are appropriately separated.

Disposal

- Be collected by a licensed chemical waste collector; and

- Be disposed/transferred to a facility licensed to receive chemical waste, such as Chemical Waste Treatment Facility (CWTF) at Tsing Yi or other chemical waste recyclers.

6.3 STAFF TRAINING

6.3.1 At the commencement of the construction works, training should be provided to workers on the concepts of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling.

6.4 AUDIT REQUIREMENTS

6.4.1 In order to review the good site practices of waste management, regular environmental site inspections and audits should be carried out by the ET at least once per week to check whether the Contractor has implemented the recommended good site practices and other mitigation measures. The inspection should look at all aspects of on-site waste management practices including waste generation, storage, recycling, transport and disposal. Apart from site inspection, documents including licences, permits, disposal and recycling records should be reviewed and audited for compliance with the legislation and Contract requirements. Designated staff of the Contractor responsible for resource allocation, staff training and controlling the relevant documents will also be interviewed to review the effectiveness of site management.

6.5 MITIGATION MEASURES

Good Site Practice

6.5.1 Under the condition of good site practices are strictly followed, it is anticipated that no adverse waste management-related impacts would arise. Recommendations for good site practices during the construction activities include:

- Nomination of approved personnel, such as a site manager, to be responsible for the implementation of good site practices, arrangements for collection and effective disposal to an appropriate facility, of all wastes generated at the site;
- Training of site personnel in site cleanliness, appropriate waste management procedures, including chemical waste handling procedures, and concepts of waste reduction, reuse and recycling;
- Provision of sufficient waste disposal points and regular collection for disposal;
- Appropriate measures to minimise windblown litter and dust during the transportation of waste by either covering trucks or by transporting wastes in enclosed containers;
- Separation of chemical wastes for special handling and appropriate treatment at the CWTF;
- Regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors;
- Implementation with a recording system for the amount of wastes generated, recycled and disposed (including the disposal sites; should be proposed; and
- A waste management plan (WMP) should be prepared in accordance with *ETWB TC No.19/2005* and submitted to the ER for approval.

Waste Reduction Measures

6.5.2 Good management and control can prevent the generation of a significant amount of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:

- Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance the reuse or recycling of material and their proper disposal;
- Encourage collection of aluminium cans and waste paper by individual collectors during construction with separate labelled bins being provided to allow the segregation of these wastes from other general refuse generated by the workforce;
- Any unused chemicals and those with remaining functional capacity be recycled as far as possible;
- Use of reusable non-timber formwork to reduce the amount of C&D materials;
- Before disposal of construction waste, wood, steel and other metals should be separated, to the extent practical for re-use and/or recycling to reduce the quantity of waste to be disposed to the landfills;
- Proper storage and site practices to reduce the potential for damage or contamination of construction materials; and
- Plan and stock construction materials carefully to reduce the amount of waste generated and avoid unnecessary generation of waste.

6.5.3 The waste management approach recommended in the EIA Study is outlined in **Appendix 1.2.**

6.5.4 In the event of complaints, or non-compliance/area of improvement is observed, the ET and the Contractor should be responsible for reviewing the effectiveness of these mitigation measures and for proposing to ER for approval, designing and implementing alternative or additional mitigation measures as appropriate.

7 LAND CONTAMINATION

7.1 SUMMARY

7.1.1 The land contamination assessment has examined the potential contaminating land uses within the Project area and investigated any potential land contamination impacts arising from the Project.

7.1.2 Based on the site appraisal, no adverse land contamination impact arising from Project is anticipated. No EM&A programme is therefore required.

8 ECOLOGY

8.1 INTRODUCTION

8.1.1 Potential ecological impacts arising from the construction and operation phases of the Project were assessed in the EIA Report. There would be no direct impact on important ecological resources anticipated. Mitigation measures have been recommended to minimize the potential indirect impacts on the nearby sensitive ecological resources (e.g. North District Park Egretry and Day Roost (NDPEDR)). With the implementation of appropriate mitigation measures, no unacceptable adverse residual impacts would be anticipated. Nonetheless, EM&A is considered necessary during both the construction and operation phases of the Project and the requirements are described below.

8.2 MITIGATION MEASURES

8.2.1 The mitigation measures recommended in the EIA Report to avoid / minimize / compensate potential ecological impacts are provided in **Appendix 1.2**. All the proposed mitigation measures are considered feasible and effective to mitigate the potential impacts.

8.3 MONITORING REQUIREMENTS

Pre-Construction Ecological Survey

8.3.1 A pre-construction ecological survey that covering the whole breeding season (March to August) will be conducted at the NDPEDR to find out the peak month(s) of the breeding season. The pre-construction ecological survey shall also verify the status and updated location of the NDPEDR for determining the 100m area around the NDPEDR for concerned mitigation measures and form a baseline information for the monitoring during construction and operation phase, which will be discussed in the below section. The findings of the pre-construction ecological survey should be submitted to relevant Government departments no later than one month before the commencement of construction of the project. Subject to the findings of the survey, the Pre-Construction Survey Report should list out details of all measures to minimize the potential impacts on the North District Park Egretry during the construction of the Project.

Ecological Survey during the Construction Phase and Operation Phase

8.3.2 Regular monitoring will be conducted within 100m of the NDPEDR at a frequency of at least monthly or more frequent during construction phase and the first breeding season (March to August) after operation. If the commencement of operation is in the middle of a breeding season, the operation phase monitoring will cover that breeding season and the next breeding season, criteria to be monitored include the status, location and extent of NDPEDR, the condition of trees used as breeding and roosting activities, the species, abundance and the returning time of the breeding and roosting ardeids, as well as their flight height and flight line. The usage of the ardeid night roost should be reviewed and analysed. If any significant decline of the usage of the NDPEDR by ardeids is identified, the cause of the decline, with reference to any changes in site condition or disturbances detected, should be reviewed to identify any unpredicted indirect ecological impacts arising from the proposed Project. Remedial measures should be developed and implemented by the Contractor as necessary. The monitoring results and evaluation of the usage of the NDPEDR should be reported in the monthly EM&A Reports.

Methodology of the Surveys

8.3.3 The pre-construction verification survey and the regular monitoring survey should be conducted to cover the peak period of ardeid activities, starting from approximately an hour before sunset

and last until nightfall when observation of ardeid is no longer possible. The exact time of sunset on the date of the survey should make reference on the website of Hong Kong Observatory. Direct observation should be made from an appropriate vantage point which enables the view of the night roost.

8.3.4 Any changes in site condition or disturbances detected or observed at the monitoring locations, including both construction and non-construction related activities, during the regular monitoring survey should also be recorded.

8.3.5 Both the pre-construction verification survey and the regular monitoring survey should also be conducted by experienced ecologist(s) with at least 7 years of relevant working experience.

8.4 AUDIT REQUIREMENTS

8.4.1 Site audits should be undertaken on a weekly basis to check the proper implementation and maintenance of recommended mitigation measures during the construction phase of the Project.

9 LANDSCAPE AND VISUAL

9.1 INTRODUCTION

9.1.1 The EIA Report has recommended landscape and visual mitigation measures for the construction and operation phases of the Project. This section defines the audit requirements to confirm the recommended landscape and visual impact mitigation measures are effectively implemented.

9.2 MITIGATION MEASURES

9.2.1 The landscape and visual mitigation measures should be incorporated into the detailed design. The mitigation measures during the construction and operation phases as recommended in the EIA Report are presented in **Appendix 1.2**. Where feasible, the construction phase mitigation measures should be implemented as early as possible in order to minimize the landscape impacts in the construction phase while the mitigation measures for the operation phase should be adopted during the detailed design and be built as part of the construction works so that they are in place before commissioning of the Project.

9.2.2 Any potential conflicts among the proposed mitigation measures, the Project works, and operation requirements should also be identified and resolved at an early stage. Any changes to the mitigation measures should be incorporated into the detailed design.

9.3 AUDIT REQUIREMENTS

9.3.1 Site audits should be undertaken during the construction phase and the 12-month establishment period (operation phase) to check that the proposed landscape and visual mitigation measures are properly implemented and maintained as per their intended objectives. Site audit for the off-site woodland compensation should be carried out throughout the agreed establishment period with LCSD and CEDD.

9.3.2 The ET shall audit the implementation of landscape construction works particularly during site clearance operations when the proposed tree felling and transplanting will take place and subsequent tree maintenance operations and planting works.

9.3.3 Site inspections should be undertaken by the ET at least once every month during the construction period, and once every two months for the 12-month establishment period during the operation phase.

10 CULTURAL HERITAGE

10.1 INTRODUCTION

10.1.1 Potential cultural heritage impacts arising from the construction phase of the Project were identified and assessed in the EIA Report. With the implementation of the recommended mitigation measures, no unacceptable cultural heritage impacts would be expected.

10.1.2 Potential cultural heritage impact arising from the operation phase of the Project is not anticipated. No mitigation measures, monitoring and audit are considered necessary during the operation phase of the Project.

10.2 MITIGATION MEASURES

Archaeology

Construction Phase

10.2.1 As a precautionary measure, the project proponent and his/her contractor are required to inform AMO immediately when any antiquities or supposed antiquities under the Antiquities and Monuments Ordinance (CAP.53) are discovered during the course of works.

Operation Phase

10.2.2 No excavation works of the Project will be involved during the operation phase, so no adverse archaeological impact is anticipated. Thus, no mitigation measure or EM&A is required.

Built Heritage

Construction Phase

10.2.3 No impact to all identified graded historic buildings, and no grading built heritage items except Shrine, So Kwun Po Tsuen (BH-01(1)) is anticipated due to considerable separation distance from the boundary of the Works Area. However, it is recommended to monitor any vibration and building movement induced by the proposed works on the graded historic buildings, i.e. No.5 Ng Uk Tsuen (GB-03(2)), which is closest to the boundary of the Works Area, as well as on the Grade 1 historic building, i.e. Pang Ancestral Hall (GB-01(2)). This will ensure that there are no negative impacts from vibration on the graded historic buildings and will also provide relevant reference data for impact assessment.

10.2.4 Although Shrine, So Kwun Po Tsuen (BH-01(1)) is located relatively closer (about 20m) to the boundary of the Works Area, potential direct and vibration impacts are not anticipated as the closest major underground construction works like piling and piling cap construction are located around 300m away. No mitigation measure or EM&A is required.

Operation Phase

10.2.5 No direct and/or indirect impacts are anticipated from the proposed new roads during the operation phase. No mitigation measure or EM&A is required.

(1) Site Code in Table 10.2 of Chapter 10 of the EIA Report.
(2) Site Code in Table 10.1 of Chapter 10 of the EIA Report.

11 ENVIRONMENTAL AUDIT

11.1 SITE INSPECTION

11.1.1 Site inspections provide a direct means to assess and confirm that the Contractor's environmental protection and pollution control measures are in compliance with the contract specifications. The site inspection will be undertaken routinely by the ET to verify that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the EIA recommendations. In addition, the ET will be responsible for defining the scope of the inspections, detailing any deficiencies that are identified and reporting any necessary action and/or additional mitigation measures that were implemented as a result of the inspection.

11.1.2 Site inspections should be carried out at least once per week. The areas of inspection should not be limited to the general environmental conditions in the vicinity of the site and the pollution control and mitigation measures within the site; the environmental conditions outside the site area which are likely to be affected, directly or indirectly, by site activities. The ET Leader should make reference to the following information in conducting the inspections:

- The EIA Study and EM&A recommendations on environmental protection and pollution control mitigation measures;
- Ongoing results of the EM&A programme;
- Works progress and programme;
- Individual works method statements which should include proposals on associated pollution control measures;
- Contract specifications on environmental protection;
- Relevant environmental legislation and guidelines; and
- Previous site inspection results undertaken.

11.1.3 The Contractor will update the ET with relevant information on the construction works prior to carrying out the site inspections. The site inspection results and their associated recommendations on improvements to the environmental protection and pollution control works should be submitted to the IEC and the Contractor in two working days, for reference and for taking immediate action. Should actions be necessary, the ET will follow up with recommendations on improvements to the environmental protection and pollution control works and will submit these recommendations in a timely manner to the IEC and the Contractor. They will also be presented, along with the remedial actions taken, in the monthly EM&A report. The Contractor should follow the procedures and time frames stipulated in the environmental site inspection for the implementation of the mitigation proposal. An action reporting system will be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

11.1.4 Ad hoc site inspections will also be carried out by the ET and site audits by the IEC if significant environmental issues are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the associated investigation work, as specified in the Action Plan for environmental monitoring and audit.

11.2 COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS

11.2.1 The Contractor should comply with contractual environmental protection and pollution control requirements, Hong Kong's environmental protection and pollution control laws.

11.2.2 In order that the works are in compliance with the contractual requirements, all works method statements (where relevant to environmental measures) submitted by the Contractor to the ER for approval should also be sent to the ET Leader for vetting to see whether sufficient environmental protection and pollution control measures have been included.

11.2.3 The ET shall review all the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.

11.2.4 The Contractor shall regularly copy inspection relevant documents to the ET Leader so that the works checking and auditing process could be carried out effectively. The relevant documents are expected to include the updated work progress reports, the updated works programme, the application letters for different licences/permits under the environmental protection laws, all valid licences/permits and environmental related records. The site diary should also be available for the ET Leader's inspection upon his request.

11.2.5 After reviewing the documentation, the ET Leader shall advise the IEC and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status of the licence/permit application and any environmental protection and pollution control preparation works is incompatible with the works programme or may result in a potential violation of environmental protection and pollution control requirements, he should also advise the Contractor and the ER in due course.

11.2.6 Upon receipt of the advice, the Contractor should undertake immediate action to remedy the situation. The ER should follow up to ensure that appropriate action has been taken by the Contractor in order to satisfy contractual and legal requirements.

11.3 ENVIRONMENTAL COMPLAINTS

11.3.1 Complaints shall be referred to the ET Leader for action. The ET Leader shall undertake the following procedures upon receipt of any environmental complaint:

(i) Log the complaint and date of receipt onto the complaint database and inform the IEC immediately;

(ii) Investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;

(iii) Identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;

(iv) Advise the Contractor if mitigation measures are required;

(v) Review the Contractor's response to identified mitigation measures and the updated situation;

(vi) If the complaint is transferred from the Environmental Protection Department (EPD), submit an interim report to the EPD on the status of the complaint investigation and follow-up action within the time frame assigned by the EPD;

(vii) Undertake additional monitoring and audit to verify the situation if necessary, and review those circumstances leading to the complaint not recurring;

(viii) Report investigation results and subsequent actions to the complainant (if the source of complaint is identified through EPD, the results should be reported within the timeframe assigned by EPD); and

(ix) Record the complaint, investigation, subsequent actions and the results in the monthly EM&A reports.

11.3.2 A flow chart of the complaint response procedure is shown in **Appendix 11.1**.

11.3.3 During the complaint investigation work, the Contractor and ER shall work with the ET in providing all necessary information and assistance for the completion of the investigation. If mitigation measures are identified as required during the investigation by the ET, the Contractor should promptly carry out the mitigation works. The ER shall ensure that the measures have been carried out by the Contractor.

11.4 LOGBOOK

11.4.1 The ET Leader will keep a contemporaneous logbook of each and every instance or circumstance or change of circumstances which may affect the EIA and every non-compliance from the recommendations of the EIA Report or the EP. The ET Leader will notify the IEC within one working day of the occurrence of any such instance or circumstance or change of circumstance. The ET Leader's logbook will be kept readily available for inspection by persons assisting in the supervision of the implementation of the EIA Report recommendations (such as IEC and Contractor) or by EPD or his authorised officers.

12 REPORTING

12.1 GENERAL

12.1.1 Upon agreement with the ER and EPD, reports can be provided in electronic format. This would enable a transition from a paper/ historic and reactive approach to an electronic/real-time proactive approach. All monitoring data, including baseline and impact monitoring, shall also be submitted in electronic format.

12.1.2 The ET Leader shall submit baseline monitoring reports, monthly EM&A reports and final EM&A review reports. In accordance with *Annex 21* of the *EIAO-TM*, a copy of the monthly and final review EM&A reports will be made available to the Director of Environmental Protection (DEP). The exact details of the frequency, distribution and time frame for submission shall be agreed with the IEC, the ER and EPD prior to the commencement of works.

12.2 INTERIM NOTIFICATION OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES

12.2.1 With reference to the EAPs, when the environmental quality performance limits are exceeded, the ET Leader shall immediately notify the IEC, CEDD and EPD, as appropriate. The notification shall be followed up with advice to IEC, CEDD and EPD on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals. A sample template for the interim notifications is presented in **Appendix 12.1**.

12.3 BASELINE MONITORING REPORT

12.3.1 Baseline Environmental Monitoring Report(s) shall be prepared within ten working days of completion of the baseline monitoring and then certified by the ET Leader. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the IEC, ER and EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be agreed upon with the IEC, the ER and EPD prior to submission.

12.3.2 The Baseline Environmental Monitoring Report shall include, but not be limited to the following information:

(i) Up to half a page executive summary;

(ii) Brief project background information;

(iii) Drawings showing locations of the baseline monitoring stations;

(iv) An updated construction programme with milestones of environmental protection/ mitigation activities annotated;

(v) Monitoring results (in both hard and soft copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;

- Monitoring locations (and depth);
- Monitoring date, time, frequency and duration; and
- Quality assurance (QA)/ quality control (QC) results and detection limits.

(vi) Details on influencing factors, including:

- Major activities, if any, are carried out on the site during the period;
- Weather conditions during the period; and
- Other factors which might affect results.

(vii) Determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;

(viii) Revisions for inclusion in the EM&A Manual; and

(ix) Comments, recommendations and conclusions.

12.4 MONTHLY EM&A REPORTS

12.4.1 The results and findings of all EM&A works required in the Manual should be recorded in the monthly EM&A reports prepared by the ET Leader and verified by the IEC. The first Monthly EM&A Report should be prepared and submitted to EPD in the month after the major construction works commence with the subsequent Monthly Reports due within ten working days of the end of each reporting month. Copies of each monthly EM&A report shall be submitted to the parties: Contractor, IEC, CEDD and EPD, as well as to other relevant departments as required. Before submission of the first monthly EM&A Report, the ET shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium.

12.4.2 The ET leader shall review the number and location of monitoring stations and parameters every six months, or on an as-needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

Contents of First Monthly EM&A Report

12.4.3 The first monthly EM&A report shall include at least but not be limited to the following:

(i) Executive summary (1-2 pages), including:

- Breaches of Action and Limit levels;
- Complaint log;
- Notifications of any summons and successful prosecutions;
- Reporting changes; and
- Future key issues.

(ii) Basic project information, including:

- Project organisation including key personnel contact names and telephone numbers;
- Construction programme;
- Management structure; and

- Works were undertaken during the month;

(iii) Environmental status, including:

- Advice on the status of statutory environmental compliance, such as the status of compliance with the EP conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
- Works undertaken during the reporting month with illustrations (such as the location of works, etc.); and
- Drawings showing the Project area, any environmentally sensitive receivers and the locations of the monitoring stations;

(iv) A brief summary of EM&A requirements, including:

- All monitoring parameters;
- Environmental quality performance limits (Action and Limit levels);
- Event and Action Plans;
- Environmental mitigation measures as recommended in the Final EIA report; and
- Environmental requirements in contract documents;

(v) Implementation status, including:

- Advice on the implementation status of environmental protection and pollution control/ mitigation measures, as recommended in the EIA report;

(vi) Monitoring results (in both hard and electronic copies) with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Monitoring parameters;
- Monitoring locations and depth;
- Monitoring date, time, frequency, and duration; and
- Weather conditions during the period.

(vii) Graphical plots of the monitored parameters in the month annotated against:

- The major activities being carried out on-site during the period;
- Weather conditions that may affect the results;
- Any other factors which might affect the monitoring results; and
- QA/QC results and detection limits;

(viii) Report on non-compliance, complaints, notifications of the summons and successful prosecutions, including; and:

- Record all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;

- Record of all notification of summons and successful prosecutions for breaches of current environmental protection/ pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;

(ix) Others:

- Summary of future key issues as reviewed from the works programme and work method statements;
- Advice on the solid and liquid waste management status;
- Record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.);
- A forecast of the works programme, impact predictions and monitoring schedule for the next three months;
- Compare and contrast the EM&A data with the EIA predictions and annotate with an explanation for any discrepancies; and
- Comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

Contents of Subsequent Monthly EM&A Report

12.4.4 Subsequent monthly EM&A reports shall include the following:

(i) Executive summary (1-2 pages), including:

- Breaches of Action and Limit levels;
- Complaint log;
- Notifications of any summons and successful prosecutions;
- Reporting changes; and
- Future key issues.

(ii) Basic project information, including:

- Project organisation including key personnel contact names and telephone numbers;
- Construction programme;
- Management structure,
- Works were undertaken during the month; and
- Any updates as needed to the scope of works and construction methodologies;

(iii) Environmental status, including:

- Advice on the status of statutory environmental compliance, such as the status of compliance with the EP conditions under the EIAO, submission status under the EP and implementation status of mitigation measures;
- Works undertaken during the reporting month with illustrations (such as the location of works, etc.); and
- Drawing(s) showing the Project site area, any environmental sensitive receivers and the locations of the monitoring stations;

(iv) Implementation status, including:

- Advice on the implementation status of environmental protection and pollution control/ mitigation measures, as recommended in the EIA report;

(v) Monitoring results (in both hard and electronic copies) with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;
- Monitoring locations and depth;
- Monitoring date, time, frequency, and duration;
- Weather conditions during the period;
- Any other factors which might affect the monitoring results; and
- QA/ QC results and detection limits;

(vi) Report on non-compliance, complaints, notifications of the summons and successful prosecutions, including:

- Record all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- Record of all notification of summons and successful prosecutions for breaches of current environmental protection/ pollution control legislations, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;

(vii) Others:

- Summary of future key issues as reviewed from the works programme and work method statements;
- Advice on the solid and liquid waste management status;

- Record of any project changes from the originally proposed as described in the EIA (e.g. construction methods, mitigation proposals, design changes, etc.);
- Comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions;

(viii) Appendices:

- Action and Limit levels;
- Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
  - Major activities being carried out on-site during the period;
  - Weather conditions during the period; and
  - Any other factors that might affect the monitoring results.
- Monitoring schedule for the present and next reporting period;
- Cumulative statistics on complaints (if any), notifications of the summons and successful prosecutions; and
- Details of complaints, outstanding issues and deficiencies.

Contents of Final EM&A Review Report

12.4.5 The final EM&A review report will be prepared by the ET Leader at the end of the construction phase of the Project. The final EM&A review report shall be submitted to the following parties: the IEC, the ER and the EPD. The final EM&A Review Report will contain at least the following information:

(i) Executive summary (1-2 pages);

(ii) Basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the course of the project or past twelve months;

(iii) A brief summary of EM&A requirements including:

- Monitoring parameters;
- Environmental quality performance limits (Action and Limit Levels); and
- Environmental mitigation measures as recommended in the Final EIA report.

(iv) Advice on the implementation status of environmental protection and pollution control/ mitigation measures, as recommended in the Final EIA report, summarised in the updated implementation schedule;

(v) Drawings showing the project area, any environmentally sensitive receivers and the locations of the monitoring and control stations;

(vi) Graphical plots of the trends of monitored parameters over the course of the project, for all monitoring stations annotated against:

- the major activities being carried out on-site during the period;
- weather conditions during the period; and

- any other factors which might affect the monitoring results.

(vii) Compare and contrast the EM&A data with the EIA predictions and annotate with an explanation for any discrepancies;

(viii) Provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;

(ix) Advice on the solid and liquid waste management status;

(x) A summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(xi) A brief review of the reasons for and the implications of non-compliance including a review of pollution sources and working procedures;

(xii) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(xiii) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(xiv) Review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost-effectiveness);

(xv) A summary record of notifications of the summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of breaches, investigation, follow-up actions taken and results;

(xvi) Review the practicality and effectiveness of the EIA process and EM&A programme (for example, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme), recommendations (for example, any improvement in the EM&A programme); and

(xvii) A conclusion to state the return to ambient and/or the predicted scenario as the EIA findings.

12.5 DATA KEEPING

12.5.1 The site documents (such as monitoring field records, laboratory analysis records, site inspection forms etc.) are not required to be included in the EM&A Reports for submission. However, the documents will be kept by the ET Leader and be ready for inspection upon request. Relevant information will be clearly and systematically recorded in the documents. The documents and data (e.g. waste data) will be kept for at least one year after the completion of the construction contract.

12.6 ELECTRONIC REPORTING OF EM&A INFORMATION

12.6.1 To enable public inspection of the baseline monitoring report and various EM&A reports via the EIAO Internet website and at the EIAO register office, electronic copies of these reports shall be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF Adobe 11 Pro version or later) unless otherwise agreed by EPD and shall be submitted at the same time as the hard copies. For the HTML version, a content page capable of providing a hyperlink to each section and sub-section of these reports shall be

included at the beginning of the document. Hyperlinks to all figures, drawings and tables in these reports shall be provided in the main text from where the respective references are made. All graphics in these reports shall be in interlaced GIF format unless otherwise agreed by EPD. The summary of the monitoring data taken shall be included in the various EM&A Reports to allow for public inspection via the EIAO Internet website. The content of the electronic copies of these reports must be the same as the hard copies.